

WHAT IS CLAIMED IS:

1 1. A method of preparing a metal surface for formation of a dielectric
2 barrier layer, the method comprising:
3 providing within a processing chamber a substrate bearing a copper layer;
4 stabilizing a flow rate of a silicon-containing precursor flowed to an exhaust of
5 the processing chamber;
6 flowing a processing gas into the processing chamber while the flow of the
7 silicon-containing precursor is stabilized; and
8 flowing the stable silicon-containing precursor into the processing chamber to
9 react with the processing gas to form a silicide layer over the copper layer.

1 2. The method of claim 1 wherein:
2 stabilizing a flow rate of a silicon precursor comprises stabilizing a flow of
3 silane; and
4 flowing the processing gas comprises flowing ammonia.

1 3. The method of claim 2 wherein flowing the processing gas comprises
2 flowing ammonia mixed with nitrogen.

1 4. The method of claim 1 wherein the silicon-containing precursor and
2 the processing gas are flowed through a common gas supply panel.

1 5. The method of claim 4 wherein the silicon-containing precursor is
2 flowed to the chamber exhaust through a divert line.

1 6. The method of claim 1 further comprising forming a dielectric barrier
2 layer over the silicide layer.

1 7. The method of claim 6 wherein forming the dielectric barrier layer
2 comprises introducing a plasma within the processing chamber.

1 8. The method of claim 6 wherein forming the dielectric barrier layer
2 comprises depositing a barrier layer selected from the group consisting of SiCN, oxygen
3 doped SiC, SiN, TiN, Ta, TaN, Ta/TaN, BLOK®, and Black Diamond®.

1 9. The method of claim 1 wherein stabilizing the flow rate of the silicon-
2 containing precursor comprises stabilizing the flow of one of silane, tri-methyl silane (TMS),
3 and dimethyl phenyl silane (DMPS).

1 10. A gas supply panel comprising:
2 a first mass flow controller configured to be in fluid communication with a
3 processing gas source through a first inlet;
4 a delivery line configured to be in fluid communication with the first mass
5 flow controller and with a processing chamber through a first outlet;
6 a second mass flow controller configured be in fluid communication with a
7 source of silicon-containing precursor through a second inlet;
8 a divert line configured to be in fluid communication with the second mass
9 flow controller and with a chamber exhaust through a second outlet; and
10 a divert valve configured to selectively place the second mass flow controller
11 in fluid communication with the delivery line or with the divert line.

1 11. The gas supply panel of claim 10 wherein the divert valve comprises a
2 three way valve.

1 12. The gas supply panel of claim 10 further comprising a shut off valve in
2 fluid communication with the second mass flow controller and with the second outlet.

1 13. The gas supply panel of claim 10 further comprising a third inlet in
2 fluid communication with the delivery line through a third mass flow controller.

1 14. The gas supply panel of claim 10 wherein the silicon-containing
2 precursor comprises a liquid, the gas supply panel further comprising:
3 an injection valve configured to be in fluid communication with the second
4 inlet and with the second mass flow controller; and
5 a third inlet configured to be in fluid communication with a carrier gas source
6 and with the injection valve.

1 15. A substrate processing apparatus comprising:
2 a processing chamber including an exhaust;

3 a gas distribution system configured to receive and deliver gases to a gas
4 distribution face plate located proximate to a substrate support within the processing
5 chamber;
6 a gas supply panel comprising,
7 a first mass flow controller configured to be in fluid communication
8 with a processing gas source through a first inlet,
9 a delivery line configured to be in fluid communication with the first
10 mass flow controller and with a first outlet,
11 a second mass flow controller configured be in fluid communication
12 with a source of silicon-containing precursor through a second inlet,
13 a divert line configured to be in fluid communication with the second
14 mass flow controller and with a second outlet, and
15 a divert valve configured to selectively place the second mass flow
16 controller in fluid communication with the delivery line or with the divert line;
17 a first conduit linking the first outlet with the processing chamber; and
18 a second conduit linking the second outlet with the processing chamber
19 exhaust.

1 16. The apparatus of claim 15 wherein the divert valve comprises a three
2 way valve.

1 17. The apparatus of claim 15 further comprising a shut off valve in fluid
2 communication with the second mass flow controller and with the second outlet.

1 18. The apparatus of claim 15 further comprising a third inlet in fluid
2 communication with the delivery line through a third mass flow controller.

1 19. The apparatus of claim 15 wherein the silicon-containing precursor
2 comprises a liquid, the gas supply panel further comprising:
3 an injection valve configured to be in fluid communication with the second
4 inlet and with the second mass flow controller; and
5 a third inlet configured to be in fluid communication with a carrier gas source
6 and with the injection valve.